

REMARKS

Attached herewith is a Petition and Fee for a one-month extension of time.

Applicant gratefully acknowledges Examiner Rude for taking time on October 6, 2005, from his busy schedule to conduct a personal interview with Applicant's representative to discuss the present Application. During the interview, Applicant's representative explained that the primary reference Zhong did not require a passivation layer, since it had a different structure from that of the secondary reference Ohta. The Examiner responded that he felt that the primary reference would reasonably have been modified in to incorporate additional moisture protection in order to improve performance, such as for military applications.

Applicant's representative countered that such motivation would merely reflect a position that the primary reference could be modified, and that such motivation would violate MPEP §2143.01: "*The mere fact that references can be combined or modified does not render the resultant combination obvious unless the prior art also suggests the desirability of the combination.*"(emphasis in MPEP itself).

The Examiner suggested that Applicant state his position clearly on the record in the next response for evaluation. Applicant's representative then suggested that the present invention would clearly be allowable if the dimensions of the overlying color filter layer were to be placed in the independent claim. The Examiner replied that he would evaluate such claim modification.

Claims 1, 2, 4-12, 15-18, and 21-26 are all the claims presently pending in the application, with only claims 1, 4, and 5 being the subject of the prior art evaluation of the Office Action dated July 28, 2005. Claims 2, 6-12, 16-23 are withdrawn from consideration as being drawn to a non-elected invention or species and there is no allowable generic or linking claim. New claims 24 - 26 are added to add the dimensions of the two predetermined thicknesses and to highlight how claim 1 is actually generic.

That is, Applicant submits that claim 1 is generic to both of the two embodiments, respectively shown in Figure 3 and Figure 6.

The present invention addresses a specific LCD configuration in which the color filter film is used both for forming the color filter and for covering the thin film transistor, the present inventor has recognized that there are two conflicting requirements of the thickness of the color film layer.

First, the layer must be sufficiently thick to form an adequate pixel color filter region. Second, in contrast, as recognized by the present inventor, the layer must also be sufficiently thin for purpose of allowing a fine pattern for the pixel electrode contact hole to be formed. Prior to the present invention, it was not recognized that the thickness of the color film layer had these two conflicting requirements in this LCD configuration.

It is noted that, notwithstanding any claim amendments made herein, Applicant's intent is to encompass equivalents of all claim elements, even if amended herein or later during prosecution.

Claims 1, 4, and 5 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over US Patent 5,994,721 to Zhong et al., further in view of US Patent 6,208,399 to Ohta et al.

This rejection is traversed in view of the discussion below.

I. THE CLAIMED INVENTION

Applicant's invention, as defined for example in independent claim 1 is directed to an active matrix liquid crystal display device having a first substrate and a second substrate.

At least one of said first substrate and said second substrate is transparent. A plurality of scanning lines is formed on the first substrate. A plurality of signal lines is formed on the first substrate crossing the scanning lines in a matrix manner.

A plurality of thin film transistors is each respectively formed at an intersection of the scanning lines and the signal lines. Each thin film transistor includes a gate electrode formed on said the substrate, a gate insulation layer formed on the gate electrode, a semiconductor layer formed on the gate insulation layer, a drain electrode formed on a first portion of the semiconductor layer and a first portion of the gate insulation layer, and a source electrode formed on a second portion of the semiconductor layer and a second portion of the gate insulation layer.

A passivation film is formed on the thin film transistors. At least one color filter is formed on the first substrate, wherein a color film forming the at least one color filter additionally covers the passivation film.

A plurality of pixel electrodes is each respectively connected to one of the thin film transistors through a contact hole and each respectively is formed on one of said at least one color filter.

A counter electrode is formed on the second substrate. A liquid crystal layer is formed between the first substrate and the second substrate, the liquid crystal layer being driven by electric fields between the pixel electrodes and the counter electrode to thereby make a display.

The color filter is formed directly on the first substrate in most of a light transmission region by removing the gate insulating layer and the passivation film within a pixel area surrounded by the scanning lines and the signal lines, a thickness of the color film forming the color filter being a preselected first thickness that provides a sufficient chromaticity for the color filter.

The passivation film provides an additional layer over the thin film transistors that reduces a thickness of material of the color filter near the contact hole to a second predetermined thickness chosen to permit a photo-crosslinkage to occur in an entire thickness

of the second thickness of the color filter material during an exposure processing for the contact hole.

Thus, it is possible to make a color filter on a contact portion sufficiently thin so that this material can be completely cured for subsequently etching of a fine pattern for the contact via holes, while the color filter on the pixel opening portion remains sufficiently thick to be effective to provide adequate color. In this manner, a high photosensitive color resist can be used and a fine pattern with small exposure can be formed. Thus, an LCD having good display quality, high precision and a high aperture can be manufactured (e.g. see page 5, lines 13-24; page 11, lines 25-27; page 12, lines 1-2; page 13, lines 9-18; and page 17, lines 1-12).

Essentially, as described beginning at line 13 of page 3 and continuing through line 10 of page 5, the inventor has recognized that the prior art has a number of problems due to the thickness of the color filter material over the TFT and, more specifically, in the drain region having the contact through hole to the pixel electrode. The present invention solves these problems by reducing the thickness of this color filter material in this region by choosing the number and thicknesses of underlying layers to achieve a thickness of overlying color filter material that will cure adequately with short exposure so as to prevent the prior art problems in the drain region that occur due to etching of the via holes.

An exemplary configuration of the first embodiment is shown in Figure 3 in which the color material on top the TFT has a thickness no greater than approximately 0.3 μm .

In an exemplary configuration of the second embodiment, as shown in Figure 5 in which the color material on top of the TFT has a thickness no greater than approximately 0.4 μm , an overcoat layer 19 is added on top of the color filter and provides several benefits, as described on page 16, including that of protecting the color filter and acting as a mask for forming the contact through hole, thereby achieving a higher aperture ratio and better display quality than that of embodiment 1.

The conventional systems, such as those discussed below and in the Related Art section of the present application, do not have such a structure, and fail to provide for such an operation.

Such combination of features, including the second predetermined thickness being less than approximately 4 μm , is clearly not taught or suggested by the cited references.

II. THE PRIOR ART REJECTION

Claims 1, 4, and 5 are rejected as unpatentable over Zhong, further in view of Ohta. The Examiner concedes that Zhong fails to provide a passivation layer over the TFT. To overcome this deficiency, the Examiner relies upon Ohta and the description at lines 34-67 of column 8, and, more specifically, upon the use of the passivation layer PSV1, which the Examiner alleges would provide the motivation to modify primary reference Zhong, since such modification would "... protect a back channel portion of the TFT and thereby stabilize a threshold voltage, V_{th} , without warping of the substrate caused by the stress of said passivation layer."

The Examiner, therefore, relies upon the description for PSV1, as contained in lines 42-49 of column 8.

Applicant submits that this motivation is, at best, a position that the modification could be made and constitutes improper hindsight, since the LCDs in Zhong and Ohta have fundamental design differences relative to the location of the color filter and the environment of the TFT. More specifically, Zhong has the color filter in direct contact with the TFT, whereas the color filters in Ohta are located on the substrate opposite to the substrate upon which is mounted the TFT, thereby leaving the TFT without a covering, unless one is added.

Applicant submits that this configuration in secondary reference requires protection

unique to this complete lack of a covering layer over the TFTs. In contrast, the TFTs in Zhong are covered by the color filters.

Moreover, the color filter material in Zhong is understood as inherently offering protection for the backgate of the TFT by reason of the description at lines 18-24 of column 7, wherein it is described that the color filter layers 101-104 “... *act as superior insulators ... in the areas 18 of overlap between the pixel electrodes and the corresponding address lines, so as to reduce cross-talk and the coupling capacitances between the pixel electrodes 3 and overlapped address line(s) in the high aperture LCD.*”

Applicant submits that this description that the color filter layer forms a “superior insulator” contradicts the Examiner’s unsupported allegation that the color filter layer above the TFT in Zhong would fail to provide sufficient protection for the backgate and would allegedly benefit from an additional passivation layer.

Applicant again submits that, unless the Examiner is able to provide documentation that supports his position that the color filter material is known in the art as failing to provide proper protection for the TFT, it would be improper to take the description from the entirely-different environment of Ohta and impute such statement as applicable to Zhong, particularly since the primary reference itself describes this material as being a “superior insulator”. The addition of another layer for “passivation” would merely increase cost of the device.

Hence, turning to the clear language of the claims, in Zhong there is no teaching or suggestion of: “... a passivation film formed on said thin film transistors ... said passivation film provides an additional layer over said thin film transistors that reduces a thickness of material of said color filter near said contact hole to a second predetermined thickness chosen to permit a photo-crosslinkage to occur in an entire thickness of said second thickness of said color filter material during an exposure processing for said contact hole”, as required by claim

Moreover, relative to new claims 24 and 25, there is no suggestion in Zhong for the claimed combination of dimensions.

For the reasons stated above, the claimed invention is fully patentable over the cited references.

III. FORMAL MATTERS AND CONCLUSION

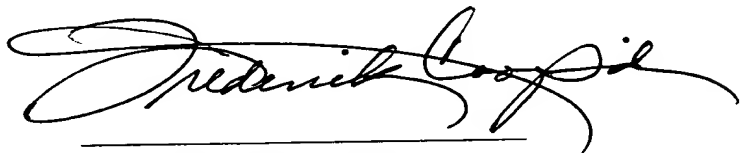
In view of the foregoing, Applicant submits that claims 1, 4, 5, 24, and 25 are patentably distinct over the prior art of record and are in condition for allowance. The Examiner is respectfully requested to pass the above application to issue at the earliest possible time.

Should the Examiner find the application to be other than in condition for allowance, the Examiner is requested to contact the undersigned at the local telephone number listed below to discuss any other changes deemed necessary in a telephonic or personal interview.

The Commissioner is hereby authorized to charge any deficiency in fees or to credit any overpayment in fees to Attorney's Deposit Account No. 50-0481.

Respectfully Submitted,

Date: 11/22/05



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